2 Sheets--Sheet 1.

# J. L. CATHCART.

## Steering Propellers.

No. 135,404. Patented Feb. 4, 1873.

Fig. 1.

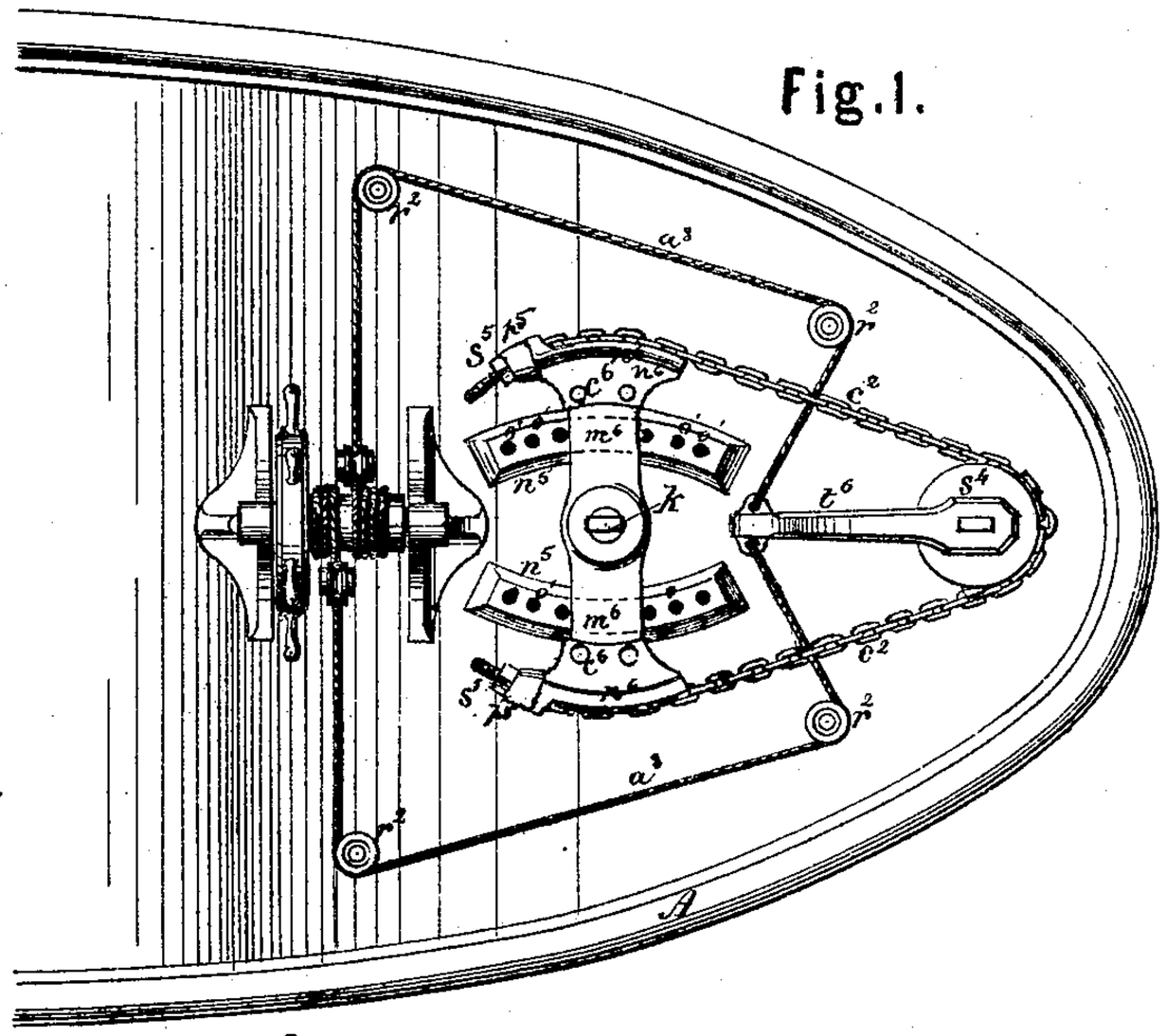
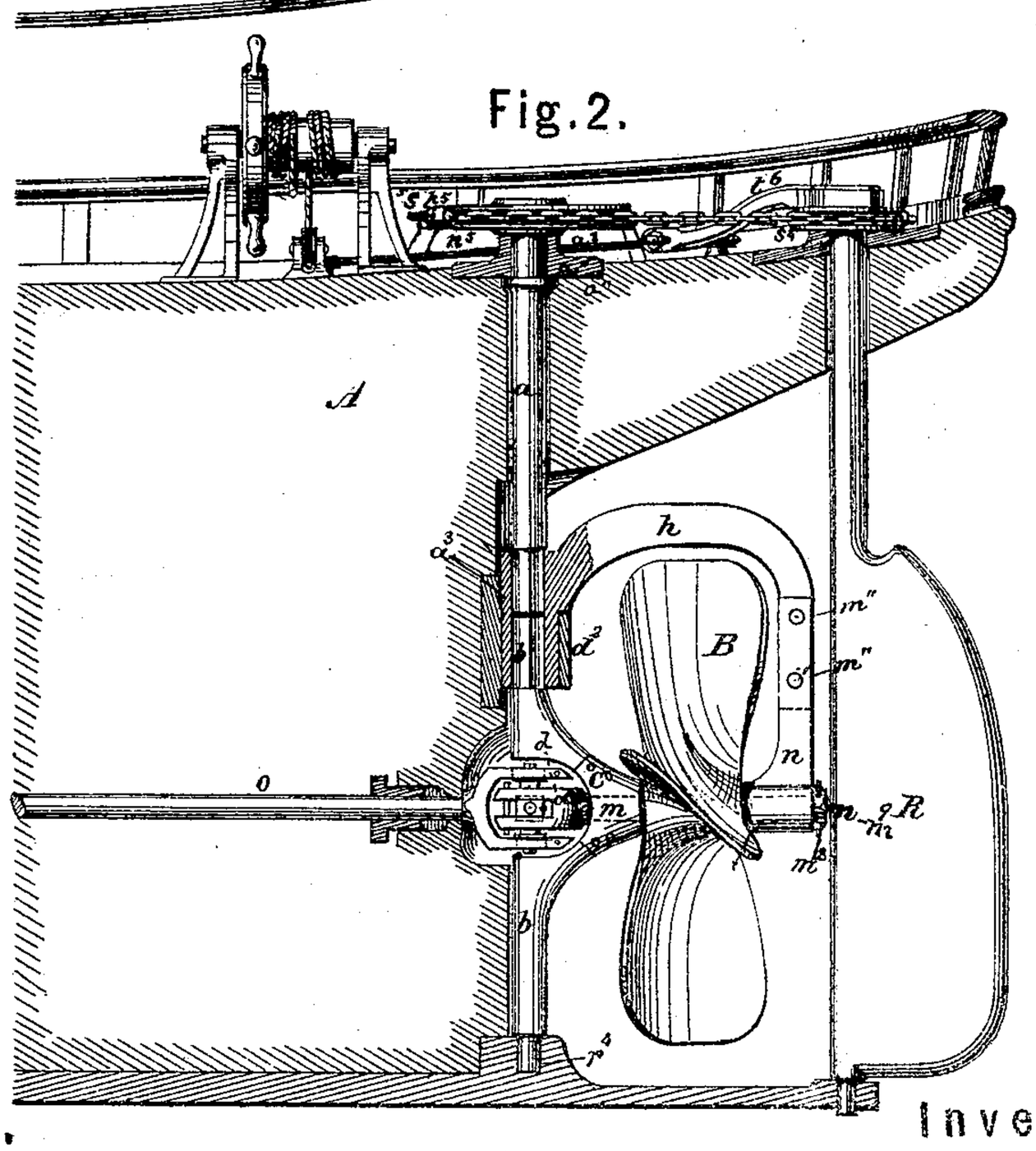



Fig. 2.




Witnesses.
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Walter Allen

Inventor.
James L. Cathcart
By Munn & Co
Attys

2 Sheets--Sheet 2.

# J. L. CATHCART.

## Steering Propellers.

No. 135,404. Patented Feb. 4, 1873.

Fig. 3.

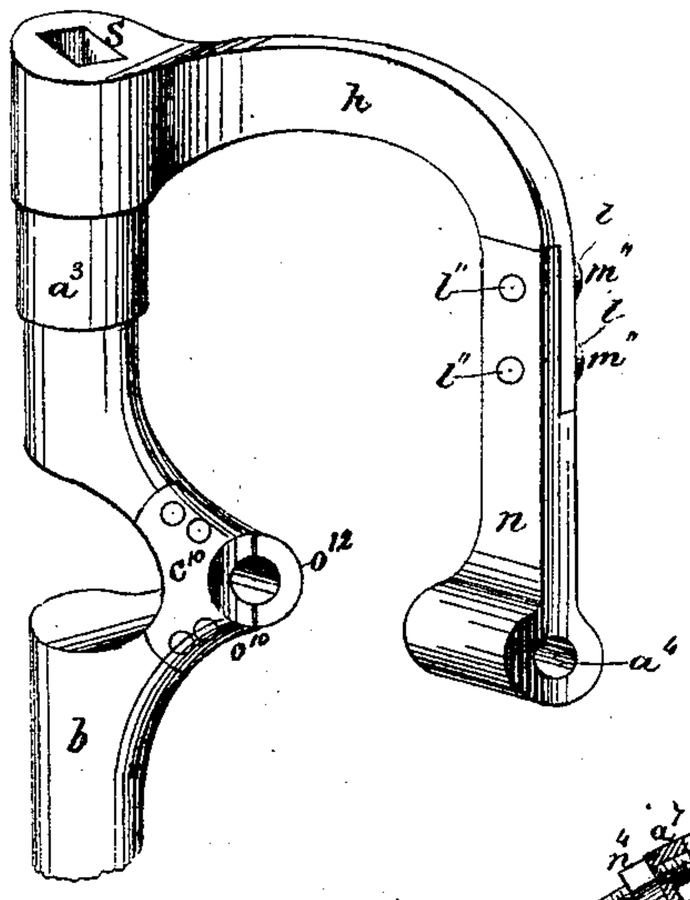



Fig. 6.

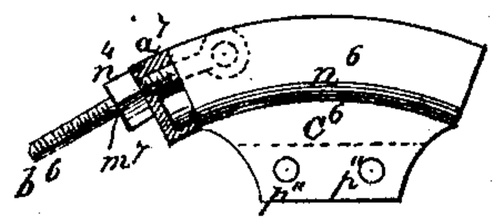



Fig. 4.

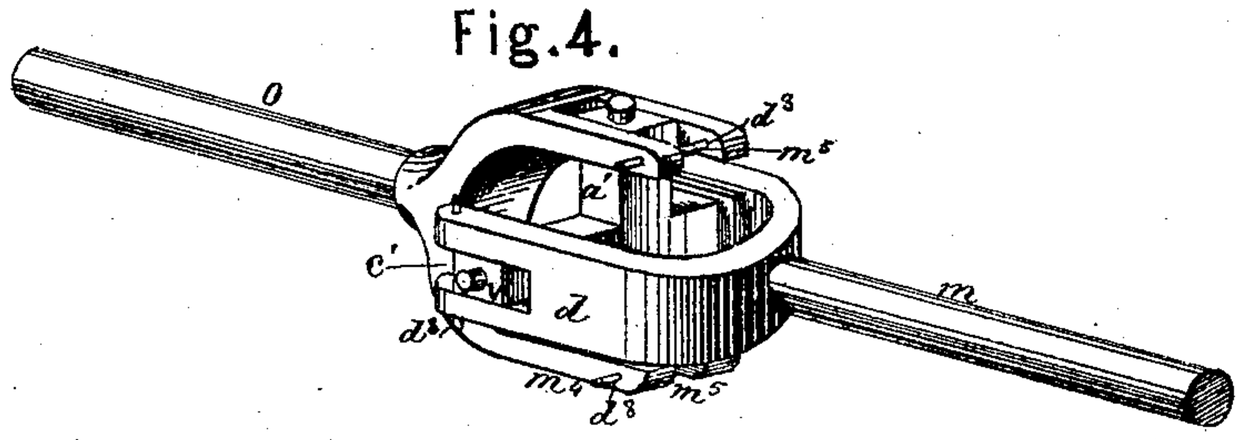
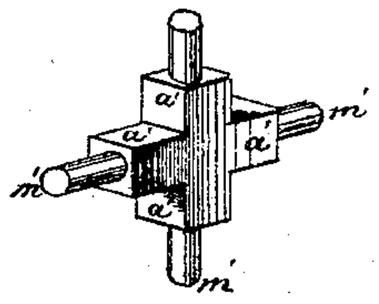



Fig. 5.




Witnesses.

Jas. L. Ewin

Walter Allen

Inventor.

James L. Cathcart

By Munn & Co

Attys

# UNITED STATES PATENT OFFICE.

JAMES L. CATHCART, OF WASHINGTON, DISTRICT OF COLUMBIA.

## IMPROVEMENT IN STEERING-PROPELLERS.

Specification forming part of Letters Patent No. **135,404**, dated February 4, 1873.

*To all whom it may concern:*

Be it known that I, JAMES L. CATHCART, of Washington, in the District of Columbia, have invented certain Improvements in Propellers, of which the following is a specification:

My invention relates to improvements in that class of propellers in which the screw, having its bearings in a frame mounted on a vertical axis, may be deflected to either side to aid or effect the steering of the vessel or for other purposes. My present improvements consist, first, in the construction of the universal joint which connects the propeller with the engine-shaft, the forks of which are slotted and connected together by arms perpendicular to each other, and having on their ends boxes, which slide in the slots of the forks. My invention also consists in connecting the head of the rudder to grooved arcs or arms on the head of the post or shaft which supports the propeller-shaft by a chain fastened to the ends of the arcs, and regulated by screw-bolts and nuts, connecting the chain with projections on the ends of the arcs, so that the propeller-shaft may be inclined to the line of motion of the vessel, and at the same time the connection of the propeller and rudder be preserved. My invention also consists in an appliance by which the axis of the propeller can be accurately adjusted relatively to the line of motion of the vessel, and so held when the propeller is not used for steering. To this end I employ movable pins or other stops, which abut against one or more arms projecting horizontally from the vertical shaft or post of the propeller-frame. My invention also consists in the peculiar construction of the crane which supports the propeller-shaft, as hereinafter more fully set forth, by the raising of which the propeller and its shaft may readily be unshipped. My invention further consists in so connecting the after bearing of the propeller with the crane that it may be detached therefrom for the removal of the propeller and its shaft.

In the accompanying drawing, Figure 1 is a top view of a vessel having a propeller with my improvements attached. Fig. 2 is a longitudinal section of the same. Fig. 3 is a detached view of the crane with the outer bearing of the propeller-shaft attached thereto. Fig. 4 is a perspective view of the universal joint which connects the propeller and engine shafts. Fig. 5 is a detached view of the cross-piece connecting the forks of the universal joint. Fig. 6 is a top view of the head of one of the radial sector-arms.

A represents the hull of a vessel, to the stern of which is pivoted the vertical shaft *b*, (see Fig. 2,) said shaft being enlarged, curved at *c*, and perforated horizontally near its upper end to form the forward bearing of a propeller-shaft, *m*, on which is keyed the propeller B. $d^2$ is a strap surrounding the shaft *b*, fastened to the hull, in which the shaft freely rotates. *a* is a vertical shaft provided with shoulders near its ends, the upper shoulder abutting against the part $a''$, and the lower shoulder against the upper end of the sleeve $a^3$ in the bent arm *h* of the crane, to prevent any vertical movement of the propeller. The vertical shaft *a* passes through the deck of the vessel, is made square at its lower end to fit the sleeve $a^3$ of the crane, and its lower end abuts against the upper end of the vertical shaft *b*, the latter being made square at its upper end. *h*, Figs. 2 and 3, is a crane, the sleeve or perforation *s* in which is made square to receive the ends of the shafts *a b*, which are similarly formed, and which it connects together so that the motion of the two would be the same as if they constituted one and the same shaft. To the curved end *h* of the crane is attached, by screws or otherwise, an arm, *n*, having a perforation, $a^4$, at its lower end, which forms the after bearing of the propeller-shaft *m*. By this construction it will be readily perceived that the propeller and its shaft can easily be detached by first taking out the fastenings of the part $a''$ to the deck and raising the shaft *a*. The screws $m''$ $m''$, connecting the bent arm *h* with the arm *n*, and the pins $d^8$ $d^8$ in the universal joint, are then removed, and the bent portion *h* of the crane raised until the lower end of the sleeve $a^3$ is above the upper end of the shaft *b*, when the arm *n* and the propeller and its shaft can readily be unshipped for repairs or other purposes, the strap $d^2$ being removed and the shaft being raised out of the socket $r^4$.

In Fig. 3 I have shown another construction of parts, by means of which the propeller and shaft may be unshipped. $c^{10}$ is a cap

attached by screws or otherwise to the curved part *c* of the vertical shaft *b*, and forming one-half, $o^{10}$, of the forward bearing of the propeller-shaft, the other half of said bearing, $o^{12}$, being made in the curved part *c* of the vertical shaft *b*, so that by removing said cap and the pins $d^8$ $d^8$ crossing the slots in the forks *d* $m^4$ of the universal joint, and the screws $m''$ $m''$, the propeller and its shaft can readily be unshipped.

It is obvious that the upper and lower ends of the shafts *a b* may be made round instead of square, and the perforations S in the crane of the same form, and the crane and shafts keyed together.

*m* (see Fig. 4) is the propeller-shaft, on the forward end of which is the fork *d*, made in one piece with the shaft, and provided with slots $c^1$ $c^1$ on the outer ends of said forks. $d^8$ $d^8$ are pins crossing the outer ends of the slots $c^1$ $c^1$ to confine the boxes *v v* in the slots and prevent their spreading. *o* is the engine-shaft, on the after end of which is the fork $m^4$, provided with slots $m^5$ $m^5$. The forks *d* and $m^4$ are precisely similar in construction, and are connected together by the cross-piece $a^1$, on the gudgeons $m^1$ of which are the boxes *v v v v*, which slide in the slots $c^1$ $c^1$ and $m^5$ $m^5$ when the propeller and its shaft are removed or when the latter is inclined to the line of direction in which the vessel is moving. To the upper end of the shaft *a* (see Fig. 1) are attached radial sector-arms $m^6$ $m^6$ having grooves in the arcs $n^6$ $n^6$, in which the chain $c^2$ operates. The chain $c^2$ passes around the sheave $s^4$ in the rudder-head, and thence into the grooves in the arcs $n^6$ $n^6$, and is attached at each end of the arcs to the projection $p^5$ $p^5$ by screw-bolts $s^5$ $s^5$ passing through the outer links of the chain, and also through perforations in the projections $p^5$ $p^5$, and regulated by nuts to tighten the chain, for a purpose which will hereinafter be described.

In Fig. 6 I have shown another construction by means of which the same end is attained. $a^7$ is a metal or other head fitting snugly over the forward end of the arc $n^6$, through a perforation, $m^7$, in which is inserted the bolt $b^6$ on the end of the chain $c^2$. $n^4$ is a nut on the outer face of the head $a^7$, by means of which the chain may be tightened or loosened. To the outer ends of the radial arms $m^6$ $m^6$ are attached, by nuts and screws or otherwise, the heads $c^6$ $c^6$, (see Figs. 1 and 6,) which may be made of cast-iron, so that they may be readily replaced if broken, or removed when it is desired to break the connection, by means of the chain $c^2$ between the propeller and the rudder.

The shafts of propellers are seldom, if ever, so arranged that the line of direction of the shaft and that of the line of motion of the vessel are coincident; hence it becomes constantly necessary to steer against the action of the propeller by means of the rudder as well as to steer the ship. This retards the movement of the vessel, and the construction I have just described obviates this difficulty, for, by regulating the length of chain, which can be done accurately and with extreme nicety by means of the screw-bolts, nuts, and projecting pieces I have described, I am enabled to set my propeller at such an angle with the line of motion of the vessel as will entirely remove the difficulty, while, at the same time, the connection between the propeller and the rudder can be preserved.

$r^2$ $r^2$ are pulleys on the deck of the vessel in which the rope or chain $a^8$, attached to the tiller of the rudder, operates, the other ends of said rope or chain passing over a windlass by which the vessel is steered, the connection, by means of the chain $c^2$, with the propeller-shaft causing the propeller and rudder always to be moved in the same direction, but to a different extent, the motion of the propeller-frame being much less than that of the rudder, owing to the greater radius of the sector-arms $m^6$ as compared with the sheave $s^4$.

If it be not desired to use the screw to aid or effect the steering of the vessel, it is still highly important to have the same adjusted relatively to the line of motion, so that the difficulty hereinbefore referred to of having to steer against the action of the propeller may be avoided. For this purpose the following or equivalent devices may be employed: $n^5$ $n^5$ (see Fig. 1) are curved blocks securely fastened to the deck under the radial arms $m^6$ $m^6$, and provided with perforations $o^1$ $o^1$, in which are inserted pins or screws, the upper ends of which abut against the radial arms and thus hold the propeller-shaft securely at any desired inclination, the steering in this case being done by the rudder. The upper end *k* of the shaft *a* (see Fig. 1) projects above the radial arms $m^6$ $m^6$ sufficiently to place a tiller over it should any accident happen to the rudder, so that the vessel in that event may be steered entirely by the propeller, or the wheel-ropes may be detached from the tiller and attached to the after ends of the radial arms when the rudder is disabled. $m^9$ (see Fig. 2) is a nut on the after end of the propeller-shaft *m*, which is securely held in place against the after bearing *n* by means of the key $m^8$, thus binding together the after face of the boss or hub of the propeller and the bearing *n* of the propeller-shaft. By this arrangement of parts the hub of the propeller and the after bearing of the propeller-shaft are securely bound together, thus preventing sea-weed, rope, or other obstructions from entering between them, and preventing the spreading or breaking of the frame.

It will be observed that the blades of the propeller will act as shears to cut off any obstructions entering between them and the frame.

The following is claimed as new:

1. The slotted forks *d* $m^4$, on the ends of the propeller and engine shaft *m o*, and pins $d^8$ $d^8$, by means of which the propeller and its shaft can readily be unshipped, substantially as described.

2. The slotted forks *d* $m^4$, in combination with the cross-piece $a^1$ provided with sliding boxes *v v*, substantially as described.

3. A laterally-adjustable propeller mounted in a frame, substantially as shown, so that it may be securely held at any desired angle with the line of motion of the vessel, as described.

4. The rudder-head provided with a sheave, $s^4$, and chain $c^2$, in combination with the radial sector-arms $m^6$ $m^6$, perforated cap $a^7$, screw-bolt $b^6$, and nut $n^4$, substantially as and for the purpose described.

5. The detachable head $c^6$ provided with a grooved arc, $n^6$, substantially as described, for the purpose set forth.

6. A detachable crane for supporting screw-propellers made in two parts, and constructed to operate as set forth.

7. The vertical shaft $b$, constructed substantially as described and provided with removable cap $c^{10}$, in combination with the propeller-shaft $m$, substantially as and for the purpose specified.

8. The crane $h$, constructed as set forth, in combination with the vertical shafts $a$ $b$, propeller B, and shaft $m$, substantially as described.

9. A propeller-shaft provided with a nut and key, or its equivalent, near its outer end, in combination with the propeller and after bearing of the propeller-shaft, whereby the propeller-hub and said after bearing are held together and obstructions thereby prevented from entering between them, and the frame kept from spreading or breaking, substantially as described.

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